
Spatio-temporal analysis of urbanization in Kashmir valley and its impact on ecology**Gulzar Bin Rehman**

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Abstract:

Kashmir valley is one of the most urbanized regions in Himalayan belt and is dominated by the urban primacy of Srinagar city which remained the hub of administration from ancient times. The city of Srinagar is witnessing unprecedented urbanization in terms of spatial expansion and population growth as a result of natural growth and migration. The distributional pattern of towns largely corresponds to the physiographic divisions of the valley. The heavy pressure of population is found in the Jhelum valley floor, and all the large and medium towns are located there along with Srinagar city. Study of urban centers for planning purposes is of vital importance for the overall development and well-being of the society. The geographical information system has proved as a very helpful tool for analyzing the urban dynamics in the valley, and it is recommended that modern techniques of remote sensing and GIS are employed to formulate policies of urban development by analyzing their spatio-temporal dynamics of population growth and land use change.

Introduction: -

Urbanization is a process of change by which a society gets transformed from an agrarian economy to an industrial one and from a small homogeneous society to a large heterogeneous one. The process of urbanization relates to the concentration of people engaged in non-agricultural occupation and concentration of non-agricultural land uses in a specialized area as a consequence of population, occupational and land use shifts. It leads to the multiplication of points of concentration and to an increase in the size of individual concentrations as one of the most conspicuous aspects of urbanization process. Urbanization thus involves:

- a. Concentration of people at population densities higher than those associated with agricultural populations with only very rare exceptions on either side.
- b. Population shifts (migration) from rural to urban areas.
- c. Occupational shifts from agricultural to nonagricultural and
- d. Land use shift from agricultural to non-agricultural.

While population shift implies a physical shift of population from rural to urban, occupational and land use shifts can take place in situ. The distinction between rural and urban settlement is not very easy to comprehend. Quite often it has been asserted that an urban settlement should be disintegrated not only on the basis of defined demographic characteristics but also on the basis of the level of infrastructural facilities. According to the criteria adopted by Indian Census Department, the urban area includes:

a) All places with a municipality corporation, cantonment board or notified town area committee, etc.

b) A Place satisfying the following three criteria simultaneously:

I. A minimum population of 5,000 persons.

II. At least 75% of male working population engaged in non agricultural pursuits and

III. A density of population of at least 400 persons per km².

The hill states of India by and large display low degree of urbanization largely due to the problems related to their terrain and the limitation of such a physiography in terms of mobility of goods, services and people due to poor accessibility. However, a large proportion of cultivated land and other areas are being encroached upon by the process of urbanization and expansion of infrastructure, services, and economic activities in the region. More recently, comparatively less accessible areas of the region are also being affected by the process of fast urbanization mainly owing to the extension of the road network, development of horticulture, the gradual shift from primary resource development practices to secondary and tertiary sectors and the growth of domestic tourism through the publicity and marketing of new tourist sites. Consequently, there has been a tremendous increase in size, area, number, and complexity of urban settlements in the region resulting in the urban expansion as well as the intensification of land use. Kashmir valley is the most urbanized region of Indian Himalayan region. The study of distribution, growth, and extent of its urban centers is vital to creating a sound economic base as urban centers are reflectors of the overall development of a region. The study reveals that Srinagar is a primate city while almost all the urban centers fall in its zone of influence. The urban development in the valley is very lopsided and imbalanced with Srinagar witnessing tremendous growth, and small urban centers have either recorded sluggish growth or have shown signs of stagnation. This twin process has made urban growth very complex phenomenon and a challenging task for city planners to ensure a reasonable quality of life and environment to the inhabitants. The unplanned and unregulated urbanization is leading to several kinds of environmental change which are more intensive and hazardous in the ecologically fragile Kashmir Himalayas. The present study will help in devising a balanced urban growth strategy in the region, by reducing the disparities in the levels of socio-economic development. The urban settlement spectrum of the Kashmir valley is dominated by the urban primacy of Srinagar city which is the biggest urban centre of the Indian Himalayan Region. With the result, the very urban settlement hierarchy is not a graded and balanced one. The urban settlement system in the region is regulated and articulated through the Srinagar city, which is the nerve centre of all the socio-economic and political activities. The urban growth is lopsided one as

the growth of the medium and small-sized towns is experiencing stagnation whereas the excessive concentration of urban growth and associated activities are taking place in Srinagar city.

Study Area:-

The valley of Kashmir, often been termed as the paradise on earth, has a unique geographical personality. Nestled in northwestern folds of the Himalayas, the Valley is surrounded on almost all sides by mountain ranges characterized by lofty snow-covered peaks, cover the area of 15440 km². The mountain range is rising to a height of 5550 meters on the northeast side (fig.1) dip-down to about 2770 meters in the south, where the Banihal-pass (Jawahar tunnel) provides an exit from the valley. The only outlet for rivers is the Baramulla - George, where the placid Jhelum River leaves the smooth grassy banks and hurries headlong down its rocky course to the plains of the south. The oval-shaped valley is filled with thick deposits of alluvium, which has blanketed even the lower slopes of the surrounding ranges. It is drained by the Jhelum and its tributaries, among which Lidder, Indus, Pohru, Sandran, Bring, Vishav, and Surkhmag are prominent. The valley is about 130 km long and 40 km wide. On the basis of Stratigraphy and altitude, the valley of Kashmir may be divided into the four physiographic divisions of Jhelum valley floor, Karewas, Side valleys and the Greater Himalayan Range. The valley of Kashmir has continental climate characterized with marked seasonality. The genesis of Kashmir weather is intrinsically linked with the mechanism of weather in the Indian subcontinent in general. Never the less, the valley is surrounded by the Himalayan ranges has a modified sub-tropical climate.

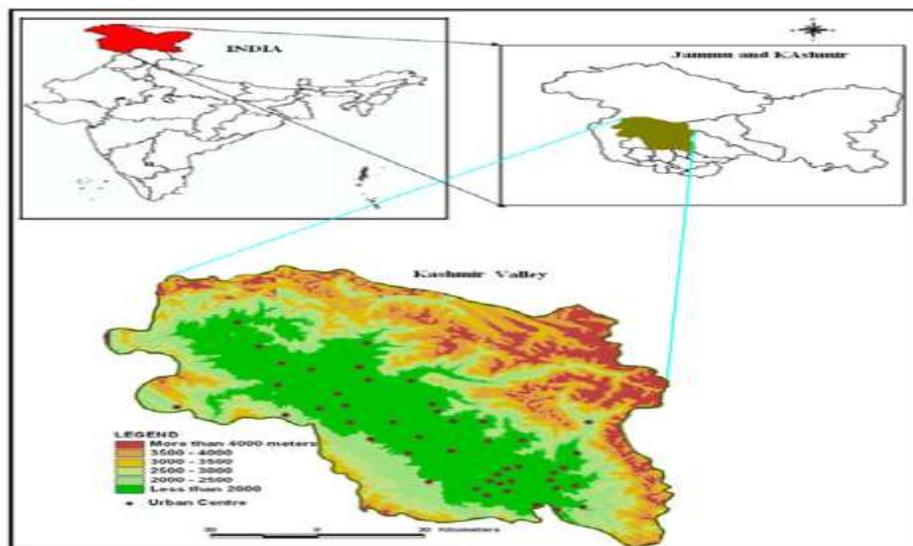


Fig 1:-Location map and altitude zonation of Kashmir valley

Materials and Methods:-

The present study has been carried out by the census data using Geographical Information System (Arc view 3.2a). The different thematic layers were superimposed to analyze the spatial growth of

urban centres in the valley. The Digital Elevation Model (DEM) of the Valley was prepared using Erdas Imagine Software. The altitude map derived from DEM along with the physiographic map was superimposed with the spatial distribution map of towns in order to determine the pattern of urban growth in the Valley. The data has also been obtained from a census of India.

Results and Discussion:-

The Process of urbanization in Kashmir valley dates back to the remote past. The ancient city which is known as Pandrethan (Puranadisthan) was founded by king Ashoka as his capital (272- 230 B.C). Since then a systematic record of the origin of towns has been established in the form of capitals. In the medieval period, a number of capital places originated but were confined within the compass of modern Srinagar and acted mainly as the socioeconomic and administrative centres. In the modern period, a remarkable shift from rural areas to urban areas has taken place. On the whole Srinagar city has been the capital of Kashmir for more than 1300 years in the past which leads to a greater degree of urbanization by way of functioning as a primate city.

A) District wise distribution of urban population:-

There is a large variation in the level of urbanization among different districts in Kashmir valley. The level of urbanization in Kashmir valley is 28.7 percent (Census of India, 2011). Among the districts, Srinagar maintains its 1st rank since 1901 so far as the percentage of the total urban population of the valley is concerned. The analysis of table 1 reveals that Srinagar district has only two urban centers but it constitutes more than 60 percent of the total urban population of the Valley and is the highest urbanized district with the level of urbanization of 95.3 percent. Srinagar is a vivid testimony of one of the historical cities of the country reflecting the rich and complex historical background. During the modern period (1947- 1997) the city recorded more or less an uninterrupted growth through successive and concerted efforts after launching Five Year Plans that marked a beginning of the Planning era in the State. The process further got strengthened, as it became the seat of power and summer Capital of the State. The development of most of the administrative, education and medical institutions and residential colonies in and around the commercial hub (Lal Chowk) changed the form and morphological structure of the city. The establishment of a number of education and medical institutions and a number of planned colonies viz Jawahar Nagar, Karanagar, Nursing Garh, Gogji Bagh, Batmaloo, Channapora, Bemina, etc. have resulted to the extensive sprawl of the city limits. Anantnag District has the highest Number of towns (12) but accommodates only 13.8 percent of the total urban population of the valley with the level of urbanization of 25.6 percent. The Significant percentage of urban population in Anantnag, Kulgam, Bandipora, and Baramulla is because of fertile soil, leveled topography, accessibility and greater interaction with Srinagar as compared to other districts. Kupwara district has the lowest percentage of urban population (3.5 percent) and the lowest share of the urban population of the valley (1.6 percent) owing to its accessibility and hill topography (fig. 2). The newly formed district of Kulgam ranks third (18.5) among the districts as far as the level of urbanization in the Valley is concerned. This is because of the fact that among the newly declared 12 towns in 2011, 6 are from Kulgam district only. The lowest number of urban centres is found in Shopian and Ganderbal districts where the respective district headquarters are the urban centres as they have recently been declared as separate districts.

Table 1. District wise distribution of urban population, Kashmir valley-2011

District	Population (Persons)	Urban Population		Share of Urban Population(%)	No. of Towns
		Absolute	Percent (%)		
Kupwara	8,75,564	31072	3.5	1.6	2
Baramulla	10,15,503	163861	16.1	8.3	7
Bandipora	3,85,099	62738	16.3	3.2	3
Srinagar	12,69,751	1210292	95.3	61.1	2
Ganderbal	2,97,003	27816	9.4	1.4	1
Budgam	7,35,753	46667	6.3	2.4	6
Pulwama	5,70,060	72156	12.7	3.6	5
Shopian	2,65,960	14115	5.3	0.7	1
Anantnag	10,70,144	273449	25.6	13.8	12
Kulgam	4,22,786	78075	18.5	3.9	7
Kashmir Valley	69,07,623	1980241	28.7	100	46

Source:-Census of India. 2011

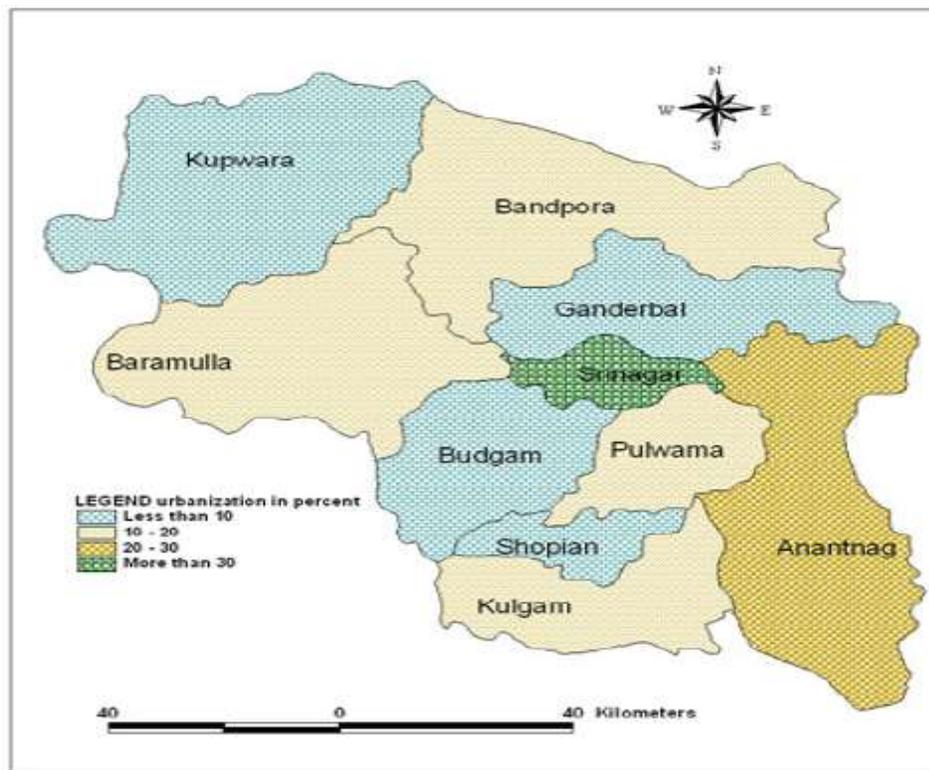


Fig 2. Level of urbanization in Kashmir valley, 2011

Growth in the number of towns: It is very difficult to compare the different urban centres so far as their growth is concerned because different urban centres were given the status of a town in different censuses and also because definitions and criteria for urban centers have changed through time. Declassification of urban centres is a major problem, which comes in the way of generalization. The growth in the number of towns during 1901-2011 shows an increase of 45 towns (table 2). There have been fluctuations in the growth pattern of towns because of the

definitional changes, some towns added and some declassified, as for example, in 1911, 11 settlements were classified as towns, but subsequently the towns namely Kulgam, Bandipora, Gulmarg, and Uri were dropped in 1921. Again Mattan and Uri were added in 1931 which continued till 1941. However, Mutton was dropped in 1961 and in 1961 Pahalgam was freshly added in place of Handwara by matching the position of 1911. However, 4 towns were added in 1971 of which Tral and Kukernag were the new classified towns followed by 7 towns in 1981. In 2001, 11 towns were added to the previous list while in 2011, 12 new towns are included of which 6 towns (50 percent) belong to Kulgam district alone. The temporal increase in the number of towns in different size classes (table 2) from 1901-2011, clearly shows that as the size of urban centres decreases their number increases. From 1911-1961 (except 1951) highest number of urban centres were class VI towns. In 1971, 1981 and 2011 highest number of towns were class V towns. However in 2001 class IV towns were dominating. Among the newly classified 12 towns in 2011, 4 are class IV towns, and the remaining 8 are class V towns. The total number of towns in the Valley has increased from only one urban centre in 1901 to 46 urban centres in 2011 (fig. 3). The highest growth in the number of urban centres was recorded for 1901-1911 where there was 12 fold increase in the number of towns. However, in 1921 the number of urban centres decreased to 7 and remained constant for 1931 and 1941 while it again decreased to 8 in 1951. From 1961 the number of towns is increasing at an increasing rate (table 2). It increased by 34 towns in the last fifty years. It was only in 2001 that the three medium towns of Anantnag, Sopore, and Baramulla crossed the population of fifty thousand and attained the status of large towns (class II towns). However, in 2011, Anantnag crossed the mark of one lakh population and became Class I town. Thus for the first time, we have two class I towns. It is important to note that Srinagar served as the only Class I town for a period of more than a century. Anantnag has the advantages of accessibility, connectivity, and interaction which makes its growth so prominent as it serves as an important link connecting Jammu city with the Srinagar city. The class VI towns are generally those statutory towns which are classified mainly on the basis of tourism. Pahalgam and Gulmarg were given this special status from 1961. It is important to mention here that the total population of Gulmarg is only 243 persons. However, Pahalgam crossed the population of six thousand for the first time in 2011.

Table 2: Distribution of towns and urban population by size classes (1901-2011)

Size Class By Population	Number of Towns and Percentage of Urban Population										
	1901	1911	1921	1931	1941	1951	1961	1971	1981	2001	2011
City (Above 100000)	1 (100)	1 (76.63)	1 (80.32)	1 (80.19)	1 (79.39)	1 (79.48)	1 (76.80)	1 (75.12)	1 (73.18)	1 (63.49)	2 (67.9)
Large Towns (50000-100000)	-	-	-	-	-	-	-	-	-	3 (15.64)	2 (6.8)
Medium towns (20000-50000)	-	-	-	-	-	-	1 (5.49)	3 (14.5)	3 (12.27)	1 (1.76)	6 (7.6)
Small Towns (10000-20000)	-	-	-	2 (9.98)	3 (13.81)	3 (15.28)	2 (10.11)	-	3 (4.33)	14 (13.67)	16 (11.3)
Urban Village (5000-10000)	-	3 (14.46)	3 (14.08)	1 (3.17)	-	3 (4.96)	3 (4.67)	7 (8.69)	9 (8.22)	9 (4.30)	17 (6.2)
Urban Hamlets (Below 5000)	-	8 (8.91)	3 (5.6)	5 (6.66)	5 (6.80)	1 (0.28)	5 (2.93)	5 (1.69)	7 (2.00)	6 (1.14)	3 (0.2)
Kashmir Valley	1 (11.2)	12 (14.64)	7 (14.21)	9 (15.67)	9 (17.30)	8 (18.41)	12 (20.23)	16 (23.13)	23 (26.42)	34 (26.92)	46 (28.7)

Note: figures in Brackets indicate percentage of urban population

Source: Census of India, 1901 to 2011

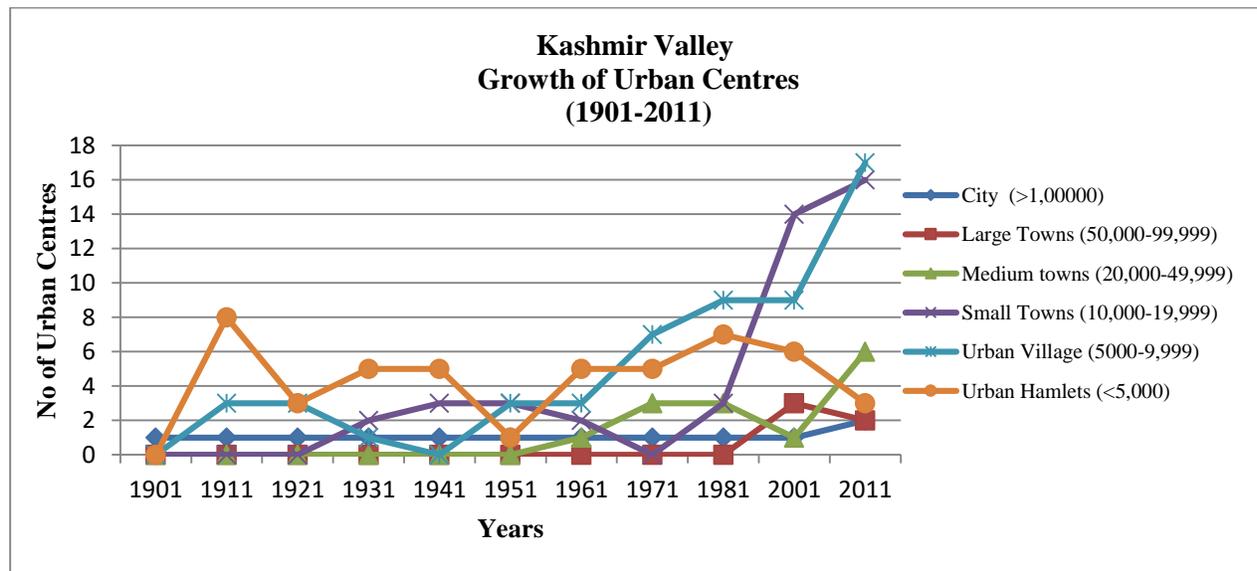


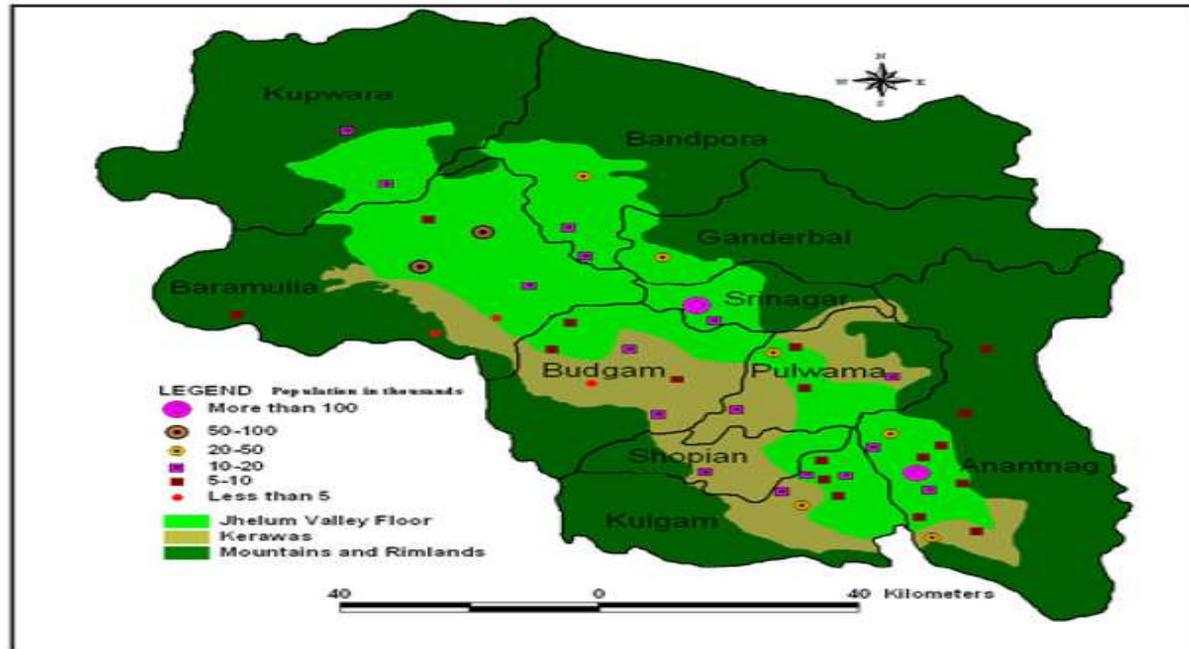
Fig 3. Growth in the number of towns in different size classes, Kashmir valley, 1901-2011

The distribution of urban population by size classes shows class I towns of Srinagar and Anantnag constitute 67.9 percent of the total urban population (fig. 4) followed by class IV towns (11.3 percent). The share of large towns has decreased from 15.64% in 2001 to 6.8 percent in 2011 because Anantnag has now attained the status of Class I town and only two towns of Baramulla and Sopore remain as large towns as none of the medium sized towns attained the status of a large town. It is also evident that all the three medium class towns in 1981 qualified the status of large towns in 2001. But only one town has been able to become a medium town in 2001 from three small towns in 1981. The class III towns and Class V towns constitute 7.6 percent and 6.2 percent of the total urban population of the valley respectively.

The net growth of the urban population of the region during 1901- 2011 is 1515 percent with the average annual growth rate of 13.77. The Urban population increased by 18.5 lakh in the last 110 years with the steady growth in the proportion of urban population to total population except for a slight decline in 1921. However, the breakup in the proportion reveals that the early decades (1901-1921) had a meager growth on account of the slow pace of socio-economic development. During 1931-51 some acceleration in the growth did take place, but on account of political unrest, little development had taken place in towns. The post-independence period may, however, be characterized by a rapid growth due to the successive five-year plan and partly due to the tourism. The explanation lies in the fact that in 1901, there were 122618 persons living in only one town but in 2011, there are 46 towns inhabiting 19.8 lakh persons which accounts for 28.7 percent of the total population of the Valley. The highest decadal growth was registered in 1981. This is because of the fact that a number of new towns were added to the previous list and also partly because of tourism. The lowest growth of urban population (1981-2010) is due to political turmoil which badly effects tourism industry and socio-economic development in Kashmir Valley. In this period of twenty years, the urban population remained almost constant with the negligible growth from 26.42 percent to 26.92 percent. It is important to mention here that in the same period of time urbanization was on peak in rest of the India.

The Distributional Characteristics of towns: The distributional pattern of towns corresponds largely with the physiographic conditions of the region. The Karewas have the problem of irrigation and upland topography and infertile soil for the cultivation of crops. The important towns which fall in this sub-region are Shopian, Tral, Pampore, Kulgam, Pulwama, and Budgam. Similarly, in case of rimlands famous hill resorts namely Pahalgam and Gulmarg are found while Uri and Kupwara wholly lie on the face of the mountain. The maximum concentration of towns in the Jhelum Plain is obvious because of the perennial characteristics, fertile soil and a somewhat leveled plain.

Figure 4: Distribution of urban centres on different physiographic divisions, Kashmir valley, 2011



The analysis of table 3 reveals that Jhelum plain which occupies 23.57 percent of the total geographical area inhabits 30 urban centres constituting 90.95 percent of the total urban population of the valley. This is due to the fact that all the large and medium-sized towns are located on Jhelum plain and have advantage of location, topography, centrality, and accessibility which makes implementation of modern facilities and technology easy there, and consequently these urban centers (especially Srinagar) have emerged as religious, cultural, commercial and administrative centres. Karewa lands with the total geographical area of 11.86 percent of the Valley have 11 towns inhabiting 7.12 percent of the total urban population. Mountains and rimlands being most extensive and widespread physiographic division cover 64.57 percent of the total geographical area inhabit 5 urban centres with 1.93 percent of the total urban population of the Valley. The urban centres in mountain areas have emerged mostly as tourist towns receiving tourists from all parts of the world.

Table 3: Number of towns in different physiographic divisions, Kashmir valley-2011

Physiographic Divisions	Area(%)	No. Of Towns	Population (%)
Jhelum Valley Floor	23.57	30	90.95
Karewas	11.86	11	7.12
Rim land & mountain	64.57	5	1.93
Total	100	46	100

Source: Computed from Census of India, 2011; Survey of India Toposheets, 1961 and DEM.

Urban Process and ecology in Kashmir valley:-

Kashmir's ecological balance has been severely disturbed as a result of unabated environmental destruction over a period of nearly five decades. Permanent snowfall on the mountains has receded, average temperatures in the valley have risen, the amount of rain and snowfall has significantly diminished. The combined effect of deforestation and mismanagement of water resources has resulted in soil erosion which is responsible for frequent flash floods now seen in the state of Jammu and Kashmir. Major lakes and rivers in Kashmir are becoming a harbor of serious diseases due to lack of maintenance, neglect, and pollution. Dal Lake, one of the worlds largest natural lakes housing hundreds of floating houseboats and home for vast reserves of aquatic life is rapidly shrinking in size. An expert Indian group was shocked to see the drastic changes in Dal Lake that have taken place in the last 15 years. According to the group, a new vegetation in the form of a mysterious red weed seen on the periphery of the lake is an indicator of the serious degree of pollution. Srinagar, the capital of Kashmir although surrounded by lakes, streams, rivers, and mountains even lack a clean drinking water supply for its domestic use! An appallingly high infant mortality of 1 in 5 is due to common infectious diseases like gastroenteritis and other water born infections is directly related to unclean water supply throughout the valley. Fourty percent of all illness is related to polluted water supplies, resulting in frequent outbreaks of infective hepatitis, gastroenteritis, poliomyelitis, typhoid, and cholera.

Kashmir once known as "paradise on earth" home to vast wildlife reserves including some species so rare existing only in Kashmir, is now fast becoming a barren, desolate piece of land. Rare species of snow leopard frequently hunted by army officials and local poachers for its precious skin and teeth has now almost become extinct. Similarly, world famous Kashmiri Otter's are now rarely seen in the valley today. The massive deployment of the Indian and Pakistani army on the line that currently divides Jammu & Kashmir, resulted in a large scale poaching as the troops in border areas indulged in killing of rare species of wildlife like the Ibex, Blue Sheep, Urian , the big horned sheep, Antelope and Snow Leopard mainly to satisfy their appetite for hunting. For example, when the ill-disciplined and poorly paid soldiers realized how valuable their furs and skin were in the international markets, they then started to hunt these rare animals for their valuable skins, horns, and teeth. Members of armed opposition groups have taken on similar pursuits. The result of this unchecked slaughter of wildlife in Kashmir has already forced some of the rare species like Snow Leopard, Flying Squirrel and Long Tailed Himalayan Marmot on the verge of extinction.

Kashmiri stag or Hangul is now only spotted in the northern regions of Kashmir valley and its population reduced to less than 300. In the first three years of military operations alone at least 400 Kashmiri stag have been killed. According to the state wildlife department, no Hangul's have been sighted between 1991-1994 in the "winter zones." Barking Deer, Cheetal, Nilgai, Markhor, Musk Deer, Himalayan Black Bear, Ibex, Blue Sheep, Marmot, and Lynx may soon become extinct if their unrestricted slaughter is not checked. The wildlife population throughout the valley is rapidly declining because of extensive areas of deforestation resulting in the loss of natural habitat for wildlife. Over 300 species of birds which included Pheasants, Quills, Partridges, Vultures, Kites, Eagles and a large number of colourful birds used to reside in virgin forests of Kashmir- today some of those lands stand naked with barely any signs of visible bird life as most of them have been

diverted for the development of tourism. However, A rich variety of birds, Ducks, Geese, Cranes, Grebes, Coots, Terns and water-fowls nest in the wetlands, lakes, and streams are found in this ecologically diversified zone. Along with the loss of forests and indiscriminate killings of wild animals, Kashmir has also lost a number of "gained wildlife sanctuaries." Alarmingly, there is no effective legislation in force to prevent the environmental and ecological damage which is being inflicted upon the natural resources of this beautiful Himalayan state.

Conclusion: -

Kashmir valley is the most urbanized region as compared to other Himalayan states is dominated by the urban primacy of Srinagar city which remained the hub of administration from ancient times. There are large variations in the urban growth scenario of different urban centres in the valley. The city of Srinagar is witnessing unprecedented urbanization in terms of spatial expansion and population growth as a result of natural growth and migration. The distributional pattern of towns largely corresponds to the physiographic divisions of the valley. The heavy concentration of urban centres is found in the Jhelum valley floor, and all the large and medium towns are located there along with Srinagar city. The study shows two important problems of urbanization in Kashmir valley. The first one is related to the disproportionate growth and concentration of people in Srinagar city which has given birth to many urban ecological and socio-demographic problems. This has happened largely because of the absence of any planning strategy at the regional level and could be rectified by providing civic amenities, infrastructural facilities and employment opportunities in small and medium towns. This will reduce immigration to Srinagar city as people would be attracted to other towns of the valley. This will also help in maintaining balanced urban development of the region. The second problem relates to the increasing concentration of people in the mountain towns of the valley which have developed mainly on account of tourism. In order to earn more revenue from tourism, the state government is developing infrastructural facilities without taking into consideration the carrying capacity of these fragile tourist nodes. It is important to mention here that world famous tourist destinations of Pahalgam and Gulmarg were given special status as tourist towns in 1961 which otherwise were not falling in the criteria to be declared as towns. These small towns are now facing environmental degradation mainly because of the large inflow of tourists beyond their carrying capacities. Study of urban centers for planning purposes is of vital importance for the overall development and well-being of the society. The geographical information system has proved as a very helpful tool for analyzing the urban dynamics in the valley, and it is recommended that modern techniques of remote sensing and GIS are employed to formulate policies of urban development by analyzing their spatiotemporal dynamics of population growth and land use change.

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